

## ABSTRACT

### METHOD AND APPARATUS FOR IMAGING AN OBJECT AND A DELIVERING DEVICE FOR LOW COHERENCE OPTICAL RADIATION

5

The invention relates to studies of internal structures of objects with the aid of optical means. According to the invention an optical system (15) of the delivering device for low coherence optical radiation, in a particular embodiment, an optical fiber probe (8), includes at least two lens components (19), (20), which have a positive focal power and are positioned

10 substantially confocally. This ensures a constant propagation time for the low coherence optical radiation propagating from a given point of the transverse scanning surface (28) or (39) to a corresponding conjugate point of the image plane (22). That provides elimination of the transverse scanning related aberration of the optical path length for low coherence optical radiation directed towards the object (11) both for a flat transverse scanning surface (28) and for

15 a transverse scanning surface (39) having a curvature. In another embodiment, together with the substantially confocal arrangement of lens components (19), (20), the longitudinal scanning is performed by varying the optical path length for the low coherence optical radiation propagating from the transverse scanning surface (28) to the optical system (15), i.e., from the end face (17) of the distal part (18) of the optical fiber (14) to the optical system (15). To achieve this, a device

20 for longitudinal scanning (10) is incorporated into the optical fiber probe (8). This ensures a corresponding shift of the focusing position of the low coherence optical radiation during longitudinal scanning, i.e., allows for alignment of the focusing position of the low coherence optical radiation with the position of the coherence gate and, consequently, their simultaneous movement.

(12) МЕЖДУНАРОДНАЯ ЗАЯВКА, ОПУБЛИКОВАННАЯ В СООТВЕТСТВИИ С  
ДОГОВОРом О ПАТЕНТНОЙ КООПЕРАЦИИ (РСТ)

(19) ВСЕМИРНАЯ ОРГАНИЗАЦИЯ  
ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ  
Международное бюро



(43) Дата международной публикации:  
18 Декабря 2003 (18.12.2003)

РСТ

(10) Номер международной публикации:  
WO 03/104845 A1

(51) Международная патентная классификация <sup>7</sup>:  
G01B 9/02, G02B 26/08, A61B 6/00

(21) Номер международной заявки: РСТ/RU03/00252

(22) Дата международной подачи:  
4 июня 2003 (04.06.2003)

(25) Язык подачи: русский

(26) Язык публикации: русский

(30) Данные о приоритете:  
2002114935 7 июня 2002 (07.06.2002) RU

(71) Заявители и

(72) Изобретатели: ГЕЛИКОНОВ Григорий Валенти-  
нович [RU/RU]; 603136 Нижний Новгород, ул.  
Героя Быкова, д. 3, кв. 19 (RU) [GELIKONOV,  
Grigory Valentinovich, Nizhny Novgorod (RU)].  
ГЕЛИКОНОВ Валентин Михайлович [RU/RU];  
603136 Нижний Новгород, ул. Героя Быкова, д. 3,  
кв. 19 (RU) [GELIKONOV, Valentin Mikhailovich,  
Nizhny Novgorod (RU)]. МЯКОВ Алексей Викто-  
рович [RU/RU]; 603089 Нижний Новгород, ул.  
Агрономическая, д. 8 (RU) [MYAKOV, Alexsey

Victorovich, Nizhny Novgorod (RU)]. ФЕЛЬД-  
ШТЕЙН Феликс Исаакович [RU/RU]; 6624  
Aintree Park Drive, apt. 203, Cleveland Ohio, 44143  
(US) [FELDCHEIN, Felix Isaakovich, Moscow  
(US)].

(74) Агент: ЛУГИНА Берта Давидовна; 603093 Ниж-  
ний Новгород, ул. Ульянова, д. 46 (RU) [LUGI-  
NA, Berta Davidovna, Nizhny Novgorod (RU)].

(81) Указанные государства (национально): CA, JP, US.

(84) Указанные государства (регионально): европей-  
ский патент (AT, BE, BG, CH, CY, CZ, DE, DK,  
EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL,  
PT, RO, SE, SI, SK, TR).

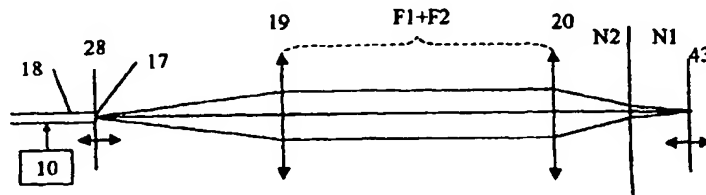
Опубликована

С отчётом о международном поиске.

В отношении двухбуквенных кодов, кодов языков и дру-  
гих сокращений см. «Пояснения к кодам и сокращениям»,  
публикуемые в начале каждого очередного выпуска Бюл-  
летеня РСТ.

(54) Title: METHOD FOR OBTAINING THE IMAGE OF AN OBJECT, DEVICE FOR CARRYING OUT SAID METHOD  
AND DEVICE FOR DELIVERING LOW COHERENT OPTICAL RADIATION

(54) Название изобретения: СПОСОБ ПОЛУЧЕНИЯ ИЗОБРАЖЕНИЯ ОБЪЕКТА, УСТРОЙСТВО ДЛЯ ЕГО  
ОСУЩЕСТВЛЕНИЯ И УСТРОЙСТВО ДОСТАВКИ НИЗКОКОГЕРЕНТНОГО ОПТИЧЕСКОГО ИЗЛУЧЕНИЯ



WO 03/104845 A1

(54) Abstract: The invention relates to the study of the internal structure of objects with the aid of optical means. The inventive optical system for a device for delivering low coherent optical radiation is embodied in the form of at least two lens components (19, 20) which are arranged approximately confocally and have a positive optical power, thereby ensuring the constancy of the travel time of the radiation from a set point on a surface (28) of a transverse scanning to a corresponding conjugate point on an image plane. The structure of the system also ensures the correction of the aberration of the optical path of the radiation which is directed towards a studied object, said aberration being associated with a transverse scanning irrespective the surface (28) thereof is flat or curved. In another embodiment of the system, wherein the components (19, 20) are arranged confocally, the longitudinal scanning is carried out by modifying the optical path of the radiation from the surface (28) to the optical system, i.e. from the distal surface (17) of the distal section of an optical fibre to the optical system. For this purpose, a device (10) for longitudinal scanning is arranged inside an optofibre probe, thereby making it possible to offset accordingly the radiation focusing point during the longitudinal scanning of the studied object, i.e. make it possible to superpose the position of the radiation focusing point with the position of a coherence window, and therefore simultaneously displace them.

[Продолжение на след. странице]